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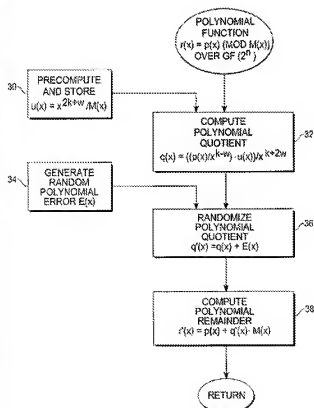
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[Continued on next page]

(54) Title: RANDOMIZED MODULAR POLYNOMIAL REDUCTION METHOD AND HARDWARE THEREFOR



(57) Abstract: A cryptographically secure, computer hardware-implemented binary finite-field polynomial modular reduction method estimates (32) and randomizes (36) a polynomial quotient $q'(x)$ used for computation of a polynomial remainder. The randomizing error $E(x)$ injected into the approximate polynomial quotient $q(x)$ is limited to a few bits, e.g. less than half a word. The computed (38) polynomial remainder $r'(x)$ is congruent with but a small random multiple of the residue $r(x)$, which can be found by a final strict binary field reduction by the modulus $M(x)$. In addition to a computational unit (10) and operations sequencer (16), the computing hardware also includes a random or pseudo-random number generator (20) for producing the random polynomial error. The modular reduction method thus resists hardware cryptanalysis attacks, such as timing and power analysis attacks.

**Declarations under Rule 4.17:**

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

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INTERNATIONAL SEARCH REPORT

International application No.

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A. CLASSIFICATION OF SUBJECT MATTER

IPC(8): H04L 9/00 (2007.01)

USPC: 713/174

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

USPC: 713/174

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC: 713/165

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

pubWEST/PUB/PB,USPT,EPAB,JPAB; OnlogPRO/Engineering; Google Scholar.

Search terms: cryptographically secure, computer hardware, finite-field, elliptical curve, polynomial, randomize

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2002/0055952 A1 (SCHROEPPEL) 09 May 2002 (09.05.2002) entire document, especially para [0044]-[0050], [0078] and FIG.3.	1-11
A	Morales-Sandoval, et al. On the hardware design of an elliptic curve cryptosystem, In Computer Science, 2004. ENC 2004. Proceedings of the Fifth Mexican International Conference in, Posted online 2004-10-16 08:49:27.0 (retrieved on 2007-06-12). Retrieved from the internet: <URL: http://ccc.inaoep.mx/~clorogrino/Publicaciones/articulos/OntheHardwareDesign%20of%20an%20Elliptic%20Curves%20Cryptosystem_ENC04_MiguelMorales.pdf >	1-11

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